

## AEROLOGICAL OBSERVATIONS

By L. T. SAMUELS

Free-air temperatures for the month were below normal except at the eastern stations, Due West and Washington, the largest negative departures occurring at the northern stations, Ellendale and Royal Center. (See Table 1.)

Relative humidity departures were small except at the higher levels at Ellendale and Royal Center where moderately large negative values occurred.

It will be noted that an abnormal, i. e., inverse, relationship occurs between the temperature and vapor pressure departures in the lower levels at Broken Arrow and Groesbeck. In this connection it is interesting to note that at both of these stations the total monthly rainfall was excessive—Broken Arrow, 7.02 inches, and Groesbeck, 16.59 inches, 0.01 inch, or more occurring on 14 days at both stations.

From Table 2 it will be seen that the resultant wind movement for the month at 3 and 4 kilometers was practically due west over the entire country except over the extreme western and southern sections. A strong northerly component persisted at these levels over the west coast while a large southerly component is found over New Orleans and an easterly over Key West, the latter persisting to 6 kilometers, above which no observations were made. The southerly component over New Orleans disappeared entirely at 6 kilometers, and a due west resultant prevailed to 8 kilometers.

The resultant velocities increased in general with increase in latitude.

Table 3 shows the record for aerological observations during the month. It will be noted that the highest average altitude obtained as well as the highest single flight during the month occurred at Groesbeck, the southernmost station.

TABLE 1.—*Free-air temperatures, relative humidities, and vapor pressures during May, 1929*

TEMPERATURE (°C.)

Altitude m. s. l.	Broken Ar- row, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Cen- ter, Ind. (225 meters)		Washing- ton, D. C. (Naval air station) (7 meters)	
	Mean	De- par- ture from nor- mal	Mean	De- par- ture from nor- mal	Mean	De- par- ture from nor- mal	Mean	De- par- ture from nor- mal	Mean	De- par- ture from nor- mal	Mean	De- par- ture from nor- mal
<i>Meters</i>												
Surface	18.7	-1.0	19.5	-0.8	11.1	-2.0	20.7	-1.8	13.8	-2.3	19.9	+1.6
500	16.4	-1.4	17.1	-0.6	10.5	-2.2	18.4	-1.4	11.1	-2.3	15.6	+0.5
1,000	14.1	-1.5	14.8	+0.2	7.0	-2.5	16.3	-1.1	7.5	-2.7	13.7	+1.4
1,500	12.2	-1.2	12.3	+0.7	4.2	-2.4	14.8	-0.8	5.4	-2.0	11.7	+2.1
2,000	9.9	-0.9	9.8	+0.9	1.2	-2.4	12.7	-0.7	3.7	-1.3	10.2	+3.0
2,500	7.1	-0.9	7.0	+0.8	-0.9	-1.6	9.7	-1.0	1.7	-0.9	8.4	+3.7
3,000	3.7	-1.2	3.9	+0.7	-2.5	-0.4	5.8	-1.9	-1.4	-1.2	5.1	+3.2
4,000	-2.7	-1.4	-----	-----	-8.0	0.0	-1.6	-3.0	-8.0	-1.7	-----	-----
5,000	-----	-----	-----	-----	-----	-----	-8.8	-4.3	-13.9	-1.8	-----	-----

RELATIVE HUMIDITY (%)

Surface	74	+4	73	+9	59	-1	81	+9	67	+3	65	+1
500	77	+8	75	+10	59	-1	80	+7	68	+4	64	+3
1,000	71	+4	73	+8	57	-2	75	+6	67	+4	60	+1
1,500	64	+2	71	+5	56	-4	60	+2	54	-7	59	-1
2,000	56	-3	66	+3	55	-5	46	-3	41	-16	54	-5
2,500	53	-3	65	+4	47	-12	46	+1	32	-19	46	+10
3,000	57	+3	57	-1	41	-16	54	+9	28	-19	51	-5
4,000	89	+34	-----	-----	40	-13	53	+7	34	-12	-----	-----
5,000	-----	-----	-----	-----	-----	-----	55	+2	34	-12	-----	-----

VAPOR PRESSURE (mb.)

Surface	16.53	+0.10	17.08	+1.79	8.36	-0.72	20.29	+0.63	11.44	-0.44	15.98	+2.22
500	14.94	+0.56	15.15	+1.83	8.08	-0.75	17.40	+0.29	9.86	-0.25	12.63	+1.82
1,000	12.05	+0.22	12.78	+1.71	6.26	-0.79	13.99	+0.23	7.79	-0.42	10.62	+1.84
1,500	9.50	+0.18	10.91	+1.67	5.00	-0.89	9.80	-0.30	5.54	-1.04	9.07	+1.51
2,000	6.94	-0.47	8.85	+1.49	3.85	-0.92	6.54	-0.78	3.88	-1.23	7.29	+0.97
2,500	5.31	-0.46	7.47	+1.60	2.60	-1.15	5.46	-0.26	2.66	-1.10	5.54	+0.56
3,000	4.51	-0.07	5.46	+0.90	2.10	-0.81	4.86	+0.13	1.51	-1.19	4.67	+0.63
4,000	4.24	+1.17	-----	-----	1.95	+0.30	2.89	-0.16	0.34	-1.18	-----	-----
5,000	-----	-----	-----	-----	-----	-----	2.25	-0.33	-----	-----	-----	-----

TABLE 2.—Free-air resultant winds (meters per second) based on pilot balloon observations made near 7 a. m. (E. S. T.) during May, 1929

Altitude m. s. l.	Broken Arrow, Okla. (233 meters)		Burlington, Vt. (132 meters)		Cheyenne, Wyo. (1,868 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Havre, Mont. (762 meters)		Jacksonville, Fla. (65 meters)		Key West, Fla. (11 meters)		Los Angeles, Calif. (40 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
<i>Meters</i>																				
Surface	°		°		°		°		°		°		°		°		°		°	
500	S 26 E	1.6	S 19 W	3.2	N 48 W	2.3	S 1 E	0.7	N 61 W	0.5	S 27 E	1.9	N 78 E	0.6	S 36 E	0.9	S 72 E	3.7	S 85 E	1.2
1,000	S 3 E	5.0	S 32 W	5.8	-----	-----	S 52 W	3.0	N 83 W	0.8	S 4 E	6.6	-----	-----	S 6 E	3.0	S 64 E	7.4	S 68 E	1.7
1,500	S 17 W	6.1	S 72 W	6.8	-----	-----	S 79 W	3.4	S 80 W	2.8	S 12 W	7.4	-----	-----	S 7 E	1.7	S 66 E	7.0	N 63 E	1.8
2,000	S 56 W	4.0	S 77 W	8.0	-----	-----	S 79 W	4.3	S 82 W	4.8	S 28 W	5.6	-----	-----	S 16 E	1.0	S 41 W	2.0	S 41 W	3.6
2,500	S 82 W	4.1	N 87 W	7.8	N 56 W	3.2	S 79 W	5.4	N 66 W	5.1	S 56 W	3.9	S 89 W	3.0	S 78 W	1.8	S 72 E	5.2	N 63 W	4.2
3,000	N 82 W	3.5	N 84 W	9.0	N 75 W	4.3	S 87 W	5.1	N 82 W	5.6	N 77 W	4.5	S 49 W	2.4	S 57 W	2.4	S 65 E	4.5	N 62 W	5.4
4,000	N 66 W	3.6	N 78 W	10.8	N 76 W	5.4	N 85 W	5.6	N 65 W	8.2	S 86 W	4.4	N 66 W	3.9	S 63 W	2.5	S 76 E	3.7	N 53 W	7.0
5,000	S 82 W	4.2	N 66 W	9.7	N 80 W	4.2	N 62 W	6.0	N 59 W	13.4	S 71 W	4.6	N 76 W	6.0	S 87 W	4.4	N 77 E	4.6	N 52 W	8.6
	N 87 W	7.0	-----	-----	N 76 W	4.6	N 80 W	7.2	N 63 W	15.9	-----	-----	N 71 W	6.3	N 85 W	4.8	N 35 E	2.4	-----	-----
Altitude m. s. l.	Medford, Oreg. (446 meters)		Memphis, Tenn. (145 meters)		New Orleans, La. (25 meters)		Omaha, Nebr. (313 meters)		Royal Center, Ind. (225 meters)		Salt Lake City, Utah (1,280 meters)		San Francisco, Calif. (60 meters)		Sault Ste. Marie, Mich. (198 meters)		Seattle, Wash. (67 meters)		Washington, D. C. (34 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
<i>Meters</i>																				
Surface	°		°		°		°		°		°		°		°		°		°	
500	S 35 E	0.6	S 60 E	1.4	S 82 E	0.7	S 87 E	0.8	S 18 W	0.3	S 13 W	0.5	S 73 W	0.9	S 83 W	0.4	S 31 E	1.5	S 89 W	0.7
1,000	S 3 E	0.4	S 20 W	4.2	S 31 E	5.1	S 54 E	2.2	S 53 W	1.7	-----	-----	N 30 W	2.9	S 77 W	3.6	S 11 W	1.6	S 63 W	4.2
1,500	N 40 W	1.0	S 37 W	5.7	S 10 E	5.1	S 35 W	1.3	S 85 W	4.0	-----	-----	N 17 W	5.8	N 84 W	5.3	S 27 W	1.7	S 84 W	5.5
2,000	N 8 W	0.4	S 51 W	4.2	S 13 E	5.2	N 55 W	2.4	N 85 W	4.8	S 33 W	0.6	N 21 W	5.7	N 72 W	6.8	S 45 W	2.8	S 83 W	8.8
2,500	N 79 W	0.7	S 54 W	3.3	S 5 W	5.3	N 64 W	3.6	N 83 W	6.2	S 2 E	1.4	N 26 W	6.6	N 81 W	8.3	S 44 W	4.3	N 84 W	9.6
3,000	N 82 W	2.5	S 59 W	3.3	S 9 W	4.2	N 56 W	4.7	S 88 W	7.6	S 61 W	1.2	N 35 W	7.6	N 68 W	7.6	S 32 W	5.8	N 83 W	10.1
4,000	N 86 W	3.1	S 46 W	3.7	S 21 W	4.0	N 78 W	5.6	N 89 W	9.6	S 69 W	2.6	N 39 W	8.2	N 55 W	7.0	-----	-----	N 89 W	10.1
5,000	N 48 W	8.8	-----	-----	S 56 W	3.5	S 84 W	6.4	S 72 W	5.4	N 49 W	9.6	N 49 W	11.7	N 58 W	11.7	-----	-----	-----	-----
	-----	-----	-----	-----	S 70 W	5.1	N 82 W	7.8	N 87 W	8.4	N 58 W	5.2	N 45 W	11.8	N 64 W	11.4	-----	-----	-----	-----

TABLE 3.—Observations by means of kites, captive and limited-height sounding balloons, and airplanes, during May, 1929

	Broken Arrow, Okla.	Due West, S. C.	Ellendale, N. Dak.	Groesbeck, Tex.	Royal Center, Ind.	Naval air station D. C.
Mean altitudes (meters) m. s. l., reached during month	2,534	2,034	2,412	2,692	2,033	2,984
Maximum altitude (meters), m. s. l., reached and date	14,399	3,754	4,374	5,306	5,103	13,852
Number of flights made	27	24	32	27	22	12
Number of days on which flights were made	27	23	30	27	22	12

<sup>1</sup> 28th.   <sup>2</sup> 4th.   <sup>3</sup> 5th.   <sup>4</sup> 27th.

In addition to the above there are approximately 100 pilot balloon observations made daily at some 45 Weather Bureau stations in the United States.